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Emulsifying and antioxidant properties of fish protein hydrolysates obtained from discarded species: evaluation on fish oil-in-water emulsions

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Fish discards are that portion of the catch (e.g. non-target species, small specimens, etc.) not retained on board and returned to the sea. Due to the fact that most of discards are dead or dying when returned to the sea, they not only represent an irresponsible underutilization of marine stocks, but also they have a negative impact on marine ecosystem [1]. Thus, the European Commission is currently undertaking a depth reform in common fisheries policy, adopting a set of measures towards the complete elimination of discards in EU fisheries, the so-called zero-discard policy [2]. Nevertheless, discards bans must be accompanied with the production of added-value products from this non-commercial material which must be totally landed. In this context, enzymatic hydrolysis of the protein fraction of discards is a convenient up-grading process, since fish protein hydrolysates (FPH) can be used as emulsifier in food applications due to their recognized emulsifying and antioxidant properties [3].

This study aimed to investigate the emulsifying and antioxidant properties of FPH for the physical and oxidative stabilization of 5 wt% fish oil-in-water emulsions. Fish oil-in-water emulsions were used since they are normally employed as delivery systems for the enrichment of food in omega-3 polyunsaturated fatty acids. FPH with different degree of hydrolysis (DH: 3, 4, 5, and 6%) were produced from muscle proteins of discarded species such as sardine (*Sardina pilchardus*) and small-spotted catshark (*Scyliorhinus canicula*). Sardine hydrolysates with low DH, 3 and 4%, presented the most effective peptides to physically stabilize emulsions with smaller droplet size. This implied more protein adsorbed at the interface with capacity to scavenge free radicals. This fact might be also responsible for the higher oxidative stability of these emulsions, as shown by their lowest peroxide value and concentration of volatiles such as 1-penten-3-one and 1-penten-3-ol. Among the hydrolysates prepared from small-spotted catshark only the hydrolysate with DH 3% yielded a physically stable emulsion with low concentration of unsaturated aldehydes. These results show the potential of FPH as alternative protein emulsifiers for the production of oxidatively stable fish oil-in-water emulsions.

[1] Kelleher, K. (2005). Discards in the world's marine fisheries: An update. FAO. Fisheries Technical Paper.

[2] Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the common fisheries policy.

[3] Klompong, V., Benjakul, S., Kantachote, D., & Shahidi, F. (2007). Antioxidative activity and functional properties of protein hydrolysate of yellow stripe trevally (Selaroides leptolepis) as influenced by the degree of hydrolysis and enzyme type. Food Chemistry, 102, 1317-1327.